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(71)Applicant : FUJITSU TEN LTD

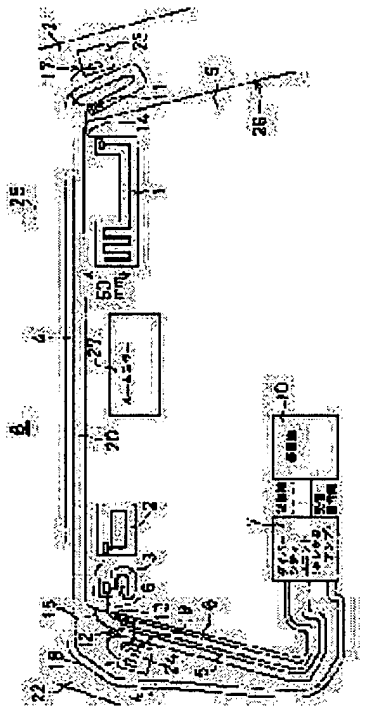
(72)Inventor : OGINO KAZUSHIGE
KONDO HARUHIKO

(54) ON-VEHICLE ANTENNA DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To arrange a plurality of antennas on a windshield so as not to prevent forward visibility from driver's seat and to improve electric characteristics.

SOLUTION: An antenna 1 and antennas 2 and 3 are arranged on the side of a driver and that of an assistant driver, respectively, in the upper portion of the windshield 9. Coaxial cables 4, 5, and 6 for feeding power to the antennas 1, 2, and 3 are laid at a pillar section 22 on the side of the assistant driver. Power-feeding points 11, 12, and 13 of each of the coaxial cables 4, 5, and 6 are provided at the pillar sections 21 and 22, and terminals 17, 18, and 19 for grounding are connected to metal foil 23 and 24 being applied to the coating film of the pillar sections 21 and 22. The coaxial cable 4 for feeding power to the antenna 1 on the side of the driver's seat is laid while passing through an area near the boundary between a roof section 25 and the windshield 9 from the pillar section 22 on the side of the assistant driver, and the power- feeding point 11 is provided at the pillar section 21 on the side of the driver's seat to be connected to a conductor 14.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] it is mounted antenna equipment which has two or more antennas which are formed of the conductor pattern on the bright film of electric insulation, and are stuck on windshield opening of an automobile, and the part of two or more of these antennas is arranged to the periphery of the method approach of an unilateral of the upper part of this windshield -- having -- the remainder of two or more of these antennas -- the upper part of this windshield -- other -- the side -- the mounted antenna equipment characterized by being arranged in the periphery of approach
[Claim 2] Mounted antenna equipment according to claim 1 characterized by establishing the grounding point for the feeding points to the antenna which is close among two or more aforementioned antennas in the pillar section of the automobile body depending on the method of both sides of the aforementioned windshield, respectively.
[Claim 3] Mounted antenna equipment according to claim 1 or 2 characterized by sticking on the aforementioned grounding point the metallic foil which carries out capacity coupling to a body metal on the painted surface of the pillar section of the aforementioned automobile body.
[Claim 4] Two or more aforementioned antennas are mounted antenna equipment according to claim 1 to 3 characterized by having shifted the use frequency band mutually.
[Claim 5] Mounted antenna equipment according to claim 1 to 4 characterized by providing the following The one side feeder which supplies electric power to the antenna which is laid along with the pillar section of the method of an unilateral of the aforementioned windshield, and is arranged in the periphery of this method approach of an unilateral it lays near the boundary of the pillar section of this method of an unilateral, and the upper limb of this windshield and the roof section of the automobile body -- having -- the aforementioned windshield -- other -- the side -- the other side feeder which supplies electric power to the antenna arranged in the periphery of approach
[Claim 6] At least one antenna in two or more aforementioned antennas the conductor which connects from the feeding point to the aforementioned conductor pattern -- the length L1 which applied the length of a line and the length of this conductor pattern Set wavelength representing a use frequency band to lambda, and the shortening coefficient of wavelength in the case of making the conductor which forms this conductor pattern approach the dielectric a glass side and near the conductor pattern, and installing it is set to alpha. It is mounted antenna equipment according to claim 1 to 5 characterized by being expressed with L1= alphaxlambda / 4, and installing a conductor pattern within the limits of the length beforehand defined from the upper limb of a windshield.
[Claim 7] the conductor which connects from the length and the aforementioned feeding point of a longitudinal direction of the field which the aforementioned conductor pattern has the portion of the two-dimensional configuration defined beforehand, and the aforementioned conductor pattern occupies to a conductor pattern -- the mounted antenna equipment according to claim 6 with which length L2 which applied the length of a line is characterized by what is expressed with L2< alphaxlambda / 4 using the aforementioned wavelength lambda and the aforementioned shortening coefficient of wavelength alpha
[Claim 8] The aforementioned two-dimensional configuration is mounted antenna equipment according to claim 7 characterized by bending in part at least and including a configuration.
[Claim 9] the aforementioned two-dimensional configuration -- the conductor for electric supply -- two or more lines prolonged in the direction which is different from a connection with a line -- the mounted antenna equipment according to claim 7 or 8 characterized by including a pattern
[Claim 10] The aforementioned two-dimensional configuration is mounted antenna equipment according to claim 7 to 9 characterized by including a clinch configuration.
[Claim 11] The aforementioned two-dimensional configuration is mounted antenna equipment according to claim 7 to 10 characterized by including a frame type configuration.
[Claim 12] The bright film which the aforementioned antenna is formed and is stuck on a windshield is mounted

antenna equipment according to claim 1 to 11 characterized by the side close to **** of this windshield not forming a straight line.

[Claim 13] The side which approaches **** of the aforementioned windshield by the aforementioned bright film is mounted antenna equipment according to claim 12 characterized by having a concave configuration which approaches **** of this windshield most near the both ends of this side.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the mounted antenna equipment which sticks and forms two or more antennas on opening of the windshield of an automobile.
[0002]
[Description of the Prior Art] Sticking and using a film antenna on the windowpane of vehicles from the former, in order to receive FM radio broadcasting, television broadcasting, VICS traffic information broadcast, etc., for example is proposed. For example, the view which sticks the antenna element formed by the conductor pattern on transparent plastic film is shown in opening of the windshield of vehicles etc. at JP,61-82502,A. Moreover, the view of the windowpane of the body, for example, a windshield, which forms an antenna in the whole surface mostly is shown in JP,9-175166,A. Moreover, the ends of the bumper before and behind the body are equipped with a sheet-like antenna, and the advanced technology used for television televising of a four-channel diversity method etc. is indicated by JP,11-88026,A. This applicant has also proposed about the film antenna for mount which sticks a film antenna on the passenger side of a windshield by Japanese Patent Application No. 11-150521.
[0003]
[Problem(s) to be Solved by the Invention] It is made to install conventionally the antenna of the film type installed in opening of the windshield of an automobile from a viewpoint of front visibility reservation of an operator in the windshield opening upper part of a passenger side, and the near [a windshield opening center] upper part. However, in installing an antenna near the central upper part of windshield opening, there is a problem from which wiring and the ground connection work of the feeding point become difficult. Moreover, the room mirror is installed, and when it becomes impossible to install an antenna by mechanical interference, it is in the windshield central upper part. Furthermore, in sticking two or more antennas, when it becomes impossible to demonstrate performance sufficient by the electric interference between antennas and distance approaches, there is a problem it becomes impossible to obtain a space diversity effect enough.
[0004] The purpose of this invention is offering the mounted antenna equipment which can acquire a good electrical property without spoiling the front visibility from a driver's seat, even if it sticks two or more antennas on a windshield.
[0005]
[Means for Solving the Problem] it is mounted antenna equipment which has two or more antennas which this invention is formed of the conductor pattern on the bright film of electric insulation, and are stuck on windshield opening of an automobile, and the part of two or more of these antennas is arranged to the periphery of the method approach of an unilateral of the upper part of this windshield -- having -- the remainder of two or more of these antennas -- the upper part of this windshield -- other -- the side -- it is mounted antenna equipment characterized by being arranged in the periphery of approach
[0006] If this invention is followed, two or more antennas stuck on windshield opening of an automobile will be formed of the conductor pattern on the bright film of electric insulation. The part of two or more antennas is arranged in the periphery of the method approach of an unilateral of the upper part of a windshield. the remainder of two or more antennas -- the upper part of a windshield -- other -- the side -- it is arranged in the periphery of approach two or more antennas -- the method approach of an unilateral of the upper part of a windshield -- other -- the side -- since it divides into approach and is arranged, an antenna is not stuck near the center of a windshield but the front visibility from a driver's seat can be kept good Since an antenna is formed on the bright film of electric insulation, it can secure visibility also in the position on which the antenna is stuck. Between the antennas which separate to the method of both sides of a windshield, and are arranged, a space diversity effect can fully be obtained and a receiving performance can be raised.
[0007] Moreover, this invention is characterized by establishing the grounding point for the feeding points to the

antenna which is close among two or more aforementioned antennas in the pillar section of the automobile body depending on the method of both sides of the aforementioned windshield, respectively.

[0008] If this invention is followed, since the grounding point for the feeding points is established in the pillar section of the nearer one among the pillar sections of the side of a windshield, respectively, while shortening distance to the grounding point of a feeding point empty-vehicle object and raising the property of an antenna, at two or more antennas, attachment workability is improvable.

[0009] Moreover, it is characterized by sticking the metallic foil which carries out capacity coupling to a body metal on the painted surface of the pillar section of the aforementioned automobile body by this invention in the aforementioned grounding point.

[0010] If this invention is followed, since a metallic foil will be stuck on a painted surface and capacity coupling will be carried out to a body metal in the grounding point of the pillar section of the automobile body, grounding for antenna electric supply will become possible if a feeder is connected to a metallic foil. While removing paint, and it becoming unnecessary to carry out a direct file to a body metal, reducing the rating at the time of antenna wearing and improving attachment workability, the corrosion resistance fall by removing paint is avoidable.

[0011] Moreover, the antenna of the aforementioned plurality in this invention is characterized by having shifted the use frequency band mutually.

[0012] If this invention is followed, since two or more antennas will be made for the use frequency band to have shifted mutually, a latus frequency band can be made to cover as two or more whole antennas.

[0013] moreover, this invention is laid along with the pillar section of the method of an unilateral of the aforementioned windshield, and is laid near the boundary of the one side feeder which supplies electric power to the antenna arranged in the periphery of this method approach of an unilateral, and the pillar section of this method of an unilateral, and the upper limb of this windshield and the roof section of the automobile body -- having -- the aforementioned windshield -- other -- the side -- it is characterized by including the other side feeder which supplies electric power to the

[0014] if this invention is followed -- the feeder to two or more antennas -- the antenna of the pillar section of the method of an unilateral to this method approach of an unilateral -- other -- the side -- electric power can be supplied to both the antennas of approach other -- the side -- since electric supply to the antenna of approach is performed [near the boundary of the pillar section of this method of an unilateral, a windshield upper limb, and the roof section of the body], the feeder to an antenna can be brought together in the pillar side of the method of an unilateral of a windshield, leading about of a feeder can be stopped for construction of the feeder to an antenna to the minimum, and attachment workability can be improved

[0015] Moreover, at least one antenna in the antenna of the aforementioned plurality in this invention the conductor which connects from the feeding point to the aforementioned conductor pattern -- the length L1 which applied the length of a line and the length of this conductor pattern Set wavelength representing a use frequency band to lambda, and the shortening coefficient of wavelength in the case of making the conductor which forms this conductor pattern approach the dielectric a glass side and near the conductor pattern, and installing it is set to alpha. It is expressed with L1= alphaxlambda / 4, and is characterized by installing a conductor pattern within the limits of the length beforehand defined from the upper limb of a windshield.

[0016] if this invention is followed -- the conductor of an antenna -- merit can get the antenna near lambda/4 which is the quadrant of wavelength substantially, and since an antenna is installed in the range of the length beforehand defined from a windshield upper limb, the front visibility from a driver's seat is also securable

[0017] moreover, the conductor which connects from the length and the aforementioned feeding point of a longitudinal direction of the field which the aforementioned conductor pattern has the portion of the two-dimensional configuration defined beforehand, and the aforementioned conductor pattern occupies by this invention to a conductor pattern -- length L2 which applied the length of a line is characterized by what is expressed with L2< alphaxlambda / 4 using the aforementioned wavelength lambda and the aforementioned shortening coefficient of wavelength alpha

[0018] If this invention is followed, since it has the portion of a two-dimensional configuration, compared with the conductor pattern on a straight line, the length of the longitudinal direction of the two-dimensional configuration of a conductor pattern can be shortened, the miniaturization of an antenna can be attained to a conductor pattern, and driver's seat front visibility can also be secured to it.

[0019] Moreover, it is characterized by for the aforementioned two-dimensional configuration bending in part at least, and including a configuration by this invention.

[0020] If this invention is followed, since it bends in part at least and a configuration is included as a two-dimensional configuration, compared with the conductor pattern which only has a configuration on a straight line, the length of the longitudinal direction of a two-dimensional configuration can be shortened, the miniaturization of an antenna can be attained, and driver's seat front visibility can also be secured.

[0021] moreover, this invention -- the aforementioned two-dimensional configuration -- the conductor for electric supply -- two or more lines prolonged in the direction which is different from a connection with a line -- it is characterized by including a pattern
[0022] if this invention is followed -- the two-dimensional configuration of the conductor pattern of an antenna -- the conductor for electric supply -- two or more lines prolonged in the direction which is different from a connection with a line -- securing the length of a required conductor pattern, since a pattern is included, the length of the longitudinal direction as the whole can be shortened, the miniaturization of an antenna can be attained, and driver's seat front visibility can also be secured
[0023] Moreover, the aforementioned two-dimensional configuration is characterized by including a clinch configuration by this invention. If this invention is followed, since a two-dimensional configuration includes a clinch configuration, the length of the whole antenna can be shortened, the miniaturization of an antenna can be attained, and driver's seat front visibility can also be secured.
[0024] Moreover, the aforementioned two-dimensional configuration is characterized by including a frame type configuration by this invention. If this invention is followed, since a two-dimensional configuration includes a frame type configuration, the length of the longitudinal direction of an antenna can be shortened, the miniaturization of an antenna can be attained, and driver's seat front visibility can also be secured.
[0025] Moreover, the bright film which the aforementioned antenna is formed by this invention and stuck on a windshield is characterized by the side close to **** of this windshield not forming a straight line.
[0026] If this invention is followed, the side which approaches **** of a windshield by the bright film which an antenna is formed and is stuck on a windshield will not form a straight line. It can be made hard to be conspicuous in having bent itself, since the side does not form the straight line even if it is easy to bend in the approach portion of a bright film and **** of a windshield, in case a bright film is stuck in the curved-surface configuration of a windshield.
[0027] Moreover, the side which approaches **** of the aforementioned windshield by the aforementioned bright film of this invention is characterized by having a concave configuration which approaches **** of this windshield most near the both ends of this side.
[0028] It can be made hard to be conspicuous in having shifted, even if a bright film and **** of a windshield are not parallel, since the side which approaches **** of a windshield by the bright film has a crevice where neighboring both ends approach **** of a windshield most, if this invention is followed.
[0029]
[Embodiments of the Invention] Drawing 1 shows the rough composition of the mounted antenna equipment as one gestalt of operation of this invention. With the mounted antenna equipment of this operation gestalt, electric power is supplied from the coaxial cables 4, 5, and 6 which are feeders using three antennas 1, 2, and 3, respectively. Each coaxial cables 4, 5, and 6 are switched in the diversity unit 7, and constitute mounted antenna equipment 8 as a whole. With the mounted antenna equipment 8 of this operation gestalt, on the front face of the windshield 9 ahead of [inside the vehicles of an automobile] a driver's seat, three antennas 1, 2, and 3 divide and are arranged at a drivers side and a passenger side. Three coaxial cables 4, 5, and 6 and the diversity unit 7 are arranged at a passenger side, and the receiver 10 for television broadcasting reception is connected to the diversity unit 7 further, for example.
[0030] the conductor by which three coaxial cables 4, 5, and 6 are divided with an outer conductor from the feeding points 11, 12, and 13 by the side of a nose of cam, and a core wire is pulled out -- it is lines 14, 15, and 16 and connects with antennas 1, 2, and 3, respectively the terminals 17, 18, and 19 for a ground connected to an outer conductor in the feeding points 11, 12, and 13 -- a conductor -- it is divided with lines 14, 15, and 16, respectively The terminals 17, 18, and 19 for a ground are connected to the metallic foils 23 and 24 stuck on the pillar sections 21 and 22 arranged at the both sides of the windshield 9 of the body 20, respectively.
[0031] With the mounted antenna equipment 8 of this operation form, plurality (1 [for example,] of three antennas 1, 2, and 3) 1 is stuck on the method of an unilateral of a windshield 9, for example, the upper part of a drivers side, along a periphery. the remaining antennas 2 and 3 of two or more antennas 1, 2, and 3 -- a windshield 9 -- other -- the side -- it is stuck on the upper part of the passenger side which is a side on the other hand, it is collected in the pillar section 22 of a passenger side, and the feeding points 12 and 13 from the coaxial cables 5 and 6 of the methods of both sides of a windshield 9 which are one side feeders form three coaxial cables 4, 5, and 6 in the pillar section 22 to the antennas 2 and 3 near a passenger side -- having -- the conductor from the feeding points 12 and 13 -- electric supply is performed through lines 15 and 16 Grounding by the terminals 18 and 19 for a ground to the body 20 is also performed to the metallic foil 24 stuck on the pillar section 22.
[0032] the conductor from the feeding point 11 which the electric supply to the antenna 1 approached and stuck on the pillar section 21 of a side far from the pillar section 22 into which three coaxial cables 4, 5, and 6 are packed is taken about so that the coaxial cable 4 which is an other side feeder may pass near the boundary of the upper limb of a

windshield 9, and the roof section 25 of the body 20 from the pillar section 22 to the pillar section 21 side, and is prepared in the pillar section 21 side -- it is carried Near the feeding point 11, a metallic foil 23 is stuck and the terminal 17 for a ground is connected.

[0033] Arrangement of two or more antennas 1, 2, and 3 in the mounted antenna equipment 8 of this operation form which was explained above is the periphery of the windshield opening 26 of the pillar sections 21 and 22 of the body 20, and the roof section 25, and is performed in the upper part of a windshield 9 by dividing into right and left. Moreover, each antennas 1, 2, and 3 are arranged to the length defined beforehand, for example, within the limits of 50mm, from the upper limb of the windshield opening 26. By this, the front visibility from a driver's seat can be secured and the mechanical interference between the room mirrors 27 further prepared in a part for the upper center section of a windshield 9 can be avoided. In addition, when using four or more antennas, two or more antennas can be arranged on both sides of a windshield 9, or one antenna can be arranged to one side and the remaining antennas can be arranged on another side.

[0034] In order to supply electric power to an antenna 1, the coaxial cable position pulled out in the pillar section 21 of a drivers side from the pillar section 22 of a passenger side can make the metal part of the roof section 25 of the body 20 which may be made to meet the upper-limit edge of a windshield 9, and touches the upper-limit side of a windshield 9 able to meet, and can also be made to perform. From the vehicle interior of a room, the construction of a coaxial cable 4 which the metal part of the roof section 25 is made to meet, and the construction of coaxial cables 4, 5, and 6 which the metal part of the pillar section 22 is made to meet cover a front-face side by interior material, and they are hidden so that it may not be visible, and they are performed. It is also possible to pull out a coaxial cable 4 in the pillar section 21 of a drivers side through the floor of a vehicle room, and to carry out from the diversity unit 7 of a passenger side, through the pillar section 21 to the antenna 1 of a drivers side. However, since many wiring for control of vehicles has accomplished from the passenger seat in the floor which passes along a drivers side and it is necessary to make it not exposed [a coaxial cable 4], the direction pulled out through the upper part of a windshield 9 from the pillar section 22 of a passenger seat can lay easily.

[0035] Drawing 2 shows the configuration of the antenna 1 of drawing 1 . An antenna 1 is transparent and is formed in the front face of the film 30 of electric insulation as a conductor pattern 31. A conductor pattern 31 can carry out pattern printing of the conductive paste containing metal powders, such as silver, or like a printed-circuit board, can carry out patterning of the metallic foil, and can form it. A conductor pattern 31 contains the bending section 32 which bends to an L type, and the meander section 33 in which bending of recurrence is formed. The meander section 33 is formed in a nose-of-cam side, and the bending section 32 is formed in a end face side. the pattern 34 for electric supply forms in the end face of the bending section 32 -- having -- the feeding point 11 of the coaxial cable 4 of drawing 1 , and a conductor -- it connects electrically by the line 14

[0036] As shown in drawing 1 , when it sticks on a windshield 9 with a film 30, a crevice 35 is established in a part for the neighboring center section which approaches the upper-limit side of a windshield 9, and the configuration from which it separated from the straight line is formed in it. Having bent will be conspicuous if **** of a windshield 9 and the side of the film 30 which counters are not parallel when a film 30 is stuck on a windshield 9 as the side which approaches **** of a windshield 9 with a film 30 is on a straight line. Since the windshield 9 has the curved-surface configuration, it is impossible for sticking a film 30 on **** of a windshield 9 in parallel completely. It can be made hard to be conspicuous, even if **** of a windshield 9 and the side of a film 30 are not completely parallel, since the crevice 35 is established in the side of a film 30 with the antenna 1 of this operation form.

[0037] Drawing 3 shows the state where an antenna 1 and the feeding point 11 of a coaxial cable 4 are connected. the conductor to which the length of the conductor which works as an antenna electrically connects the feeding point 11 and the pattern 34 for electric supply -- the conductor of length L1a of a line 14, and the conductor pattern 31 of an antenna 1 -- it is the sum L1 with long L1b If the length L1 of this conductor has predetermined length to wavelength fundamentally, it will operate as an antenna. However, about the length of a conductor, you have to take the rate of shortening into consideration. and -- the case of this operation form -- a conductor -- since a line 14 approaches a windshield 9, and is arranged and the conductor pattern 31 is further formed on the film 30, you have to take into consideration the rate of shortening in the state where dielectrics, such as a windshield 9 and a film 30, were approached such a rate of shortening -- alpha, then a conductor -- when merit L1 has a relation as shown in the 1st following formula, the antenna 1 of this operation form can be operated as a quadrant wavelength antenna

L1= alphaxlambda / 4 -- (1)

[0038] Here, lambda is wavelength. When the conductor pattern 31 has the two-dimensional configuration, length L2b of the longitudinal direction of a conductor pattern 31 can become shorter than actual conductor pattern length L1b. therefore, the conductor from the feeding point 11 to the pattern 34 for electric supply -- length L2 which added length L1a of a line 14 and length L2b of the longitudinal direction of a conductor pattern 31 can be made shorter than the

length of L1 shown in the 1st formula, and the 2nd following formula is realized
L2< alphaxlambda / 4 -- (2)
[0039] Drawing 4 shows the rough configuration of the antenna 40 as other forms of operation of this invention. With the antenna 40 of this operation form, the frame type conductor pattern 41 is formed on the film 30 shown in drawing 2 . The frame type conductor pattern 41 can also make length L2b of a longitudinal direction shorter than actual conductor pattern length L1b, and can attain a miniaturization.
[0040] Drawing 5 shows the rough configuration of the antenna 50 as a form of further others of operation of this invention. The conductor pattern 51 to which 50 consists of two or more patterns on the film 30 of drawing 2 is formed with the antenna of this operation form. Also with this operation form, length L2b of the longitudinal direction of a conductor pattern 51 can be made shorter than length L1b which actually operates as a conductor pattern, and can attain the miniaturization of an antenna. In addition, each conductor patterns 31, 41, and 51 shown in drawing 2 , drawing 4 , and drawing 5 can also be combined and used.
[0041] Drawing 6 shows the cross-section composition of the portion which grounds with the mounted antenna equipment 8 of drawing 1 by sticking metallic foils 23 and 24 on the pillar sections 21 and 22. The body metal 60 with which the pillar sections 21 and 22 have conductivity serves as a ground, and the paint film 61 is formed in the front face. With this operation form, metallic foils 23 and 24 are stuck through the adhesion material 62. Between metallic foils 23 and 24 and the body metal 60, the paint film 61 as a dielectric which has electric insulation intervenes, and capacity coupling of metallic foils 23 and 24 and the body metal 60 is carried out. The terminals 17, 18, and 19 for a ground pulled out from the feeding points 11, 12, and 13 of coaxial cables 4, 5, and 6 have the end-connection child 64 at the nose of cam of an earth wire 63. If the end-connection child 64 is pushed against the front face of metallic foils 23 and 24 and it fixes by the adhesive tape 65, the terminals 17, 18, and 19 for a ground are electrically connectable with metallic foils 23 and 24.
[0042] Since capacity coupling of between metallic foils 23 and 24 and the body metal 60 is carried out, to the RF relevant to an antenna, it can flow electrically, and operation equivalent to the case where remove the paint film 61 partially and the direct file of the earth wire 63 is carried out to the body metal 60 can be made to perform. Since the terminals 17, 18, and 19 for a ground can be grounded only by sticking metallic foils 23 and 24 on the front face of the paint film 61, work becomes easy, and since the paint film 61 is not removed, it can also secure reliability.
[0043] Drawing 7 shows the example of the frequency characteristic to the property of the antenna 1 shown in drawing 2 . As an object of the frequency characteristic, the VSWR value change which is a voltage standing wave ratio is shown. In the example shown in drawing 7 , by the 90-108MHz frequency band which is a low VHF frequency band of television broadcasting, a VSWR ratio becomes low and it turns out that impedance matching of an electric supply system and an antenna is good. a conductor -- if the position where a VSWR value is low will carry out a parallel displacement to the left-hand side of drawing 7 if merit is lengthened, and it shortens, a parallel displacement will be carried out to right-hand side The antennas 2 and 3 shown in drawing 1 have prepared the range with a low VSWR value in the one where frequency is higher than the antenna 1 shown in drawing 7 , although pattern configurations differ. It becomes receivable [the frequency diversity method which can perform good reception over the large range of television broadcasting by this].
[0044] With the operation form explained above, although the mounted antenna equipment 8 which receives television broadcasting is explained, this invention is applicable similarly as antenna equipment for receiving FM broadcasting, traffic information, etc.
[0045]
[Effect of the Invention] As mentioned above, according to this invention, two or more antennas can be divided into the method of both sides of the upper part of opening of a windshield, and can be arranged, and the front visibility from a driver's seat can be kept good. Since two or more antennas are detached and installed in the method of both sides of a windshield, a space diversity effect can be obtained easily and a receiving performance can also be raised.
[0046] moreover -- since it carries out in the position which approached the feeding point of an antenna since installation to the body prepared in the feeding point to two or more antennas was performed to the pillar which has an antenna in a near position according to this invention -- the conductor from the feeding point to an antenna -- attachment workability is also improvable while being able to shorten the length of a line
[0047] Moreover, according to this invention, if it connects electrically to a metallic foil, based on capacity coupling of a metallic foil and a body metal, grounding equivalent to the case where it connects with a body metal substantially can be secured, and a good electrical property can be acquired by easy work in a grounding point.
[0048] Moreover, according to this invention, a large frequency band can be covered using two or more antennas.
[0049] Moreover, while according to this invention packing both a one side feeder and an other side feeder into the pillar section of one side of a windshield and improving attachment workability, an electrical property can supply